number of the Bulletin of the Academy of Science of Cracow a theory which will at the least serve as a good working hypothesis. It is based on the corpuscular theory of matter, and assumes that amongst the systems of electrons which constitute the atoms and molecules, there are a number in a state such that a small increment of energy will render them unstable, and one or more electrons will be shot out of the system. These are in turn supposed to enter systems in which the electrons are capable of executing oscillations without becoming unstable. It is these electrons which give out the fluorescent light when the former systems are rendered unstable by the incidence of radiation on them. The author shows that this theory is in keeping with the known facts of fluorescence and phosphorescence.

MESSRS. LEITZ AND CO. have put on the market a universal projection apparatus designed in accordance with the suggestions of Prof. Kaiserling. We have examined this apparatus, and find it most complete. It is available for projection on the screen under a variety of conditions, viz. by transmitted light for both lantern and microscopical work, and by incident light for the projection of woodcuts and natural objects. The special feature of the design consists in the ease with which the change can be made from one mode of projection to another. For episcopic projection it is arranged that the object may either lie horizontally on the table or be in a vertical position. Thus, if it be desired to project on the screen part of a hospital patient, the subject is simply placed at the side so that the part in question may be illuminated by the lamp and completely reflected by the mirror. The electric lamp employed is one of the type which this firm is adapting to several purposes. The carbons are at right angles to one another, the positive one being horizontal and lying along the optic axis. With this arrangement the full crater becomes operative in producing useful light. The result is considerably greater efficiency, a power of 10,500 candles being obtainable with a current of 30 amperes. It is unnecessary to state that the optical part possesses the excellence of this firm's work. The lantern condenser is sufficiently large to illuminate a half-plate transparency, and the whole of it can be simultaneously projected on the screen. For microscopic projection both objectives and projection eye-pieces are quickly changed by revolving carriers. For the lower power objectives the entire field is in focus at once; it is only in the case of the difficult projection with 1/12th inch (oil immersion) that the peripheral regions are blurred. At present there is no polarising device, but this is under design. The entire apparatus stands inside a curtained frame, which prevents the escape of light into the room except through the lens. It stands on the floor, with the optic axis about 144 cm. from it.

HAZELL'S Annual for 1909 has been received. The volume includes much information of scientific interest, and is a valuable, concise record of progress in many departments of intellectual, industrial, and social activity.

MESSRS. SIEMENS BROTHERS AND CO., LTD., have issued a convenient self-opening pocket diary for 1909. In addition to the usual calendar notes and diary, the book contains useful tables and illustrations of various dynamos and other machines made by Messrs. Siemens.

IN an article in the Johns Hopkins Hospital Bulletin for November, Dr. Peyton Rous describes the course of physiological pathology which is given in the school of medicine of the University of Michigan. It extends over three hours a day during three weeks, and includes the pathology of vascular, cardiac, and respiratory disturbances.

THE fourth quarterly bulletin, for the year 1906–7, of the results obtained during the periodic cruises and in the intermediate periods, has been issued by the Conseil permanent international pour l'Exploration de la Mer. The bulletin deals with the following points:—condition of the atmosphere; the temperature and salinity of the surface water; the temperature, salinity, density, &c., of sea-water at different depths; oxygen, nitrogen, and carbon dioxide dissolved in sea-water; and plankton. The bulletin is published by Messrs. A. F. Høst and Son, of Copenhagen.

THE recent address delivered by Mr. Rudyard Kipling to the students of the medical school of the Middlesex Hospital, at the opening of the present session, has been published by Messrs. Macmillan and Co., Ltd., in the form of a booklet bound in limp cloth, at the price of 1s. net. The title of the little book is "Doctors," and, in addition to the address, the book contains as frontispiece a photograph of Mr. Kipling and a preface describing the work of the hospital, written by Mr. Reginald Lucas. We notice that the book is being sold for the benefit of the Middlesex Hospital.

THE 1909 number of "Whitaker's Almanac" is the forty-first annual issue. It is difficult to imagine what one would do without this indispensable book of reference, which has again increased in size and usefulness. Among new articles which have been included we notice those dealing with the navigation of the air and the radio-telegraphic convention, while the following interesting features will continue to appeal to students of science:—progress of astronomical science, the year's weather in the British Isles, the storms and floods of the year, and the earthquakes and volcanic eruptions, the year being in each case that ending on October 31, 1908.

OUR ASTRONOMICAL COLUMN.

MOREHOUSE'S COMET, 1908*c*.—A further discussion of the photographs of Morehouse's comet, taken at Juvisy, is published by M. Flammarion in the December number of the *Bulletin de la Société astronomique de France* (p. 513).

M. Flammarion reproduces further photographs, and shows that, while the main features of the tail are explicable by the Maxwell-Bartoli laws of light-pressure demonstrated experimentally by Lebedew, there are other features which point distinctly to the operation of other causes. For example, the photograph of October 15 shows the now well-known dislocation of the tail, at some distance from the head, which might be due to the interference of meteoritic matter. On the photograph of October 17, however, there is no definite dislocation, although there is distinct evidence that the tail, as a whole, suffered some retardation in respect to the motion of the nucleus. Several possible explanations are offered, with full reserve, for this phenomenon. One is that the æther may have a density which is not homogeneous; another is that the sun is constantly repelling matter into interplanetary space, and that this matter would retard the masses of tenuous vapours forming the tail of the comet. A third explanation is that most generally accepted, viz. that the retardations and dislocations are probably caused by the interference of masses of meteorites with which space is probably peopled.

A note in the same journal (p. 534) announces that MM. le Comte de la Baume Pluvinel and Baldet have, since the publication of their preliminary paper in the *Comptes rendus*, obtained many more photographs of the

spectrum of the comet, including some taken with a calcite-quartz spectrograph, which show new radiations and will enable better wave-length values to be determined; the conclusions published in the first note are to be looked upon as only provisional.

OBSERVATIONS OF THE SURFACES OF JUPITER'S PRINCIPAL SATELLITES AND OF TITAN.—During the 1907–8 opposition of Jupiter, M. J. Comas Solá continued his observations of the principal Jovian satellites, and now publishes his results, with drawings of J iii. and iv., in No. 4290 of the *Astronomische Nachrichten* (p. 290, December 11).

Satellite i. appears to be definitely ellipsoidal, the flattening amounting to as much as one-fifth of the major axis. The direction of the longest axis is not, according to M. Solá's observations, parallel to that of Jupiter's bands, but has a position-angle some 28° greater than that of the bands.

With most other observers, M. Solá finds that the second satellite always appears round.

The observations of J iii. are given in detail, and many features on the satellite's surface noted. Among these, white polar caps, varying in intensity and size from time to time, equatorial bands, and shadowy areas were observed, and, from the varying appearance of the latter it would appear that the effects of the satellite's rotation were seen.

Satellite iv. presented no feature which could be seen definitely, with the exception of a very faint north polar cap on December 24, 1907, but several were suspected from time to time.

The observations of Titan indicate that this member of the Saturnian family has a more or less dense atmosphere, for the limbs were always dark and difficult to see, whilst towards the centre of the disc lighter patches were visible. The drawing for August 13, 1907, shows two of these patches having the appearance of a very diffuse double star.

CORRECTIONS OF THE POSITION AND DIAMETER OF MERCURY.—From observations of the contacts during the transit of Mercury on November 13–14, 1907, Prof. Stroobant has deduced corrections for the position and diameter of the planet, and publishes the results in part i., vol. xii., of the *Annales astronomiques de l'Observatoire royal de Belgique*.

The observations were made at thirty-three observatories in different localities in Europe, South Africa, and the United States, and their discussion leads to the following results:—Instead of the diameter being 6″·61, at unit distance, as usually accepted, it is 6″·16, and, consequently, the actual radius, taking the equatorial radius of the earth as 6378 km., is 2232 km. From this it follows that, as compared with that of the earth, the volume of Mercury is 0·043 instead of 0·052, whilst the density is 1·42 instead of 1·17, if the accepted value for the mass be retained. The corrections to the position of the planet in the equatorial coordinates are $\Delta\alpha = +0\cdot066$s. and $\Delta\delta = -0''\cdot22$, and in the ecliptic coordinates $+0''\cdot97$ and $+0''\cdot04$ in longitude and latitude respectively.

THE SOUTH POLAR CAP OF MARS.—Bulletin No. 35 of the Lowell Observatory contains Prof. Lowell's measures, made from drawings, of the size of the south polar cap of Mars between March 22 and November 13, 1907.

The tabulated results give the history of the cap for about eight of our months, from about its maximum to near its minimum area, and show that its size decreased regularly from about 0·388 of a hemisphere to 0·002.

THE "COMPANION TO THE OBSERVATORY."—This useful annual, published by Messrs. Taylor and Francis at 1*s.* 6*d.*, contains the usual data and ephemerides for the observations of the sun, planets, eclipses, satellites, variable and double stars, &c.

Mr. Denning has revised the meteor notes, Mr. Maw has supplied a number of observations of double stars, and M. Baillaud has furnished advance proofs of the *Annuaire du Bureau des Longitudes* from which the list of Algol variables has been copied.

A useful list of the standard times of various countries using the Greenwich meridian is given on p. 32, and from the table of the magnetic elements for Greenwich Observatory we see that the "inferred" values for 1909 are:—declination, 15° 50′ W.; horizontal force, 0·1854; dip, 66° 55′.

THE NIZAMIAH OBSERVATORY AT HAIDARABAD.—The establishment by his Highness the Nizam of Haidarabad of a well-equipped astronomical observatory in his dominions is referred to in the *Times* of December 17. The equipment includes, besides the purely astronomical and meteorological instruments, a very complete photographic department and extensive workshops fitted with modern tools and appliances for both wood and metal working.

PRIZE SUBJECTS PROPOSED BY THE FRENCH ACADEMY OF SCIENCES FOR THE YEAR 1910.

GEOMETRY.—The grand prize of the mathematical sciences (3000 francs). The problem of finding all the systems of two meromorphic functions in the plane of a complex variable and connected by an algebraic relation is known. The analogous question is suggested for a system of three uniform functions of two complex variables, having everywhere at a finite distance the character of a rational function and connected by an algebraic relation. In default of a complete solution of the problem, to indicate examples leading to classes of new transcendental functions. The Francœur prize (1000 francs), for work in pure or applied mathematics; the Poncelet prize (2000 francs), for a work on pure mathematics.

Mechanics.—A Montyon prize (700 francs), for inventing or improving instruments useful to the progress of agriculture, the mechanical arts, or sciences; the Fourneyron prize (1000 francs), for an experimental and theoretical study of the effects of shocks of a hydraulic ram in elastic tubes.

Navigation.—The extraordinary prize of 6000 francs, for work tending to increase the efficiency of the French naval forces; the Plumey prize (4000 francs), for improvements in steam engines or any other invention contributing to the progress of steam navigation.

Astronomy.—Pierre Guzman prize (100,000 francs), for the discovery of a means of communicating with any planet other than Mars, or, failing this, the interest will be awarded for work leading to progress in astronomy; the Lalande prize (540 francs); the Valz prize (460 francs); the Janssen prize, for an important progress in astronomical physics.

Geography.—The Tchihatchef prize (3000 francs), for Asiatic exploration; the Binoux prize (2000 francs), for work on geography or navigation; the Delalande-Guérineau prize (1000 francs); the Gay prize (1500 francs), for zoological and anthropological researches in South America, especially in the region of the Andes.

Physics.—The Hébert prize (1000 francs), for a discovery in electricity of practical or industrial use; the Hughes prize (2500 francs); the Kastner-Boursault prize (2000 francs), for the best work on the application of electricity in the arts, industry, or commerce.

Chemistry.—The Jecker prize (10,000 francs), for work in organic chemistry; the Cahours prize (3000 francs), for the encouragement of young chemists; Montyon prizes (unhealthy trades) (2500 francs and a mention of 1500 francs), for improving the hygienic conditions of an unhealthy trade or calling; the Berthelot prize (500 francs); the Alhumbert prize (1000 francs), for an experimental study of the electrical properties of the metallic alloys.

Mineralogy and Geology.—The Delesse prize (1400 francs).

Botany.—The Desmazières prize (1600 francs), for a memoir on cryptogams; the Montagne prize (1500 francs), for work on the anatomy, physiology, development, or description of the lower cryptogams; the de Coincy prize (900 francs), for a work on phanerogams; the de la Fons-Melicocq prize (900 francs), for a work dealing with the botany of the north of France; the Bordin prize (3000 francs), for a study of the origin, development, and disappearance of the transitory tissues which may enter at various periods into the structure of the vascular plant.